Kentucky Academic Standards for Mathematics: Grade 6 Overview

Ratios and Proportional Relationships (RP)	The Number System (NS)	Expressions and Equations (EE)	Geometry (G)	Statistics and Probability (SP)
• Understand ratio concepts and use ratio reasoning.	• Apply and extend previous understandings of multiplication and division to divide fractions by fractions. • Multiply and divide multi-digit numbers and find common factors and multiples. • Apply and extend previous understanding of numbers to the system of rational numbers.	• Apply and extend previous understandings of arithmetic to algebraic expressions. • Reason about and solve one-variable equations and inequalities. • Represent and analyze quantitative relationships between dependent and independent variables.	• Solve real-world and mathematical problems involving area, surface area and volume.	• Develop understanding of the process of statistical reasoning. • Develop understanding of statistical variability. • Summarize and describe distributions.

In grade 6, instructional time should focus on four critical areas:

1. **In the Ratios and Proportional Relationships domain, students will:**
   - use reasoning about multiplication and division to solve ratio and rate problems about quantities;
   - connect understanding of multiplication and division with ratios and rates by viewing equivalent ratios and rates as deriving from and extending, pairs of rows (or columns) in the multiplication table and by analyzing simple drawings that indicate the relative size of quantities; and
   - expand the scope of problems for which they can use multiplication and division to solve problems and they connect ratios and rates.

2. **In the Number System domain, students will:**
   - use the meaning of fractions and relationships between multiplication and division to understand and explain why the procedures for dividing fractions make sense;
   - extend their previous understandings of number and the ordering of numbers to the full system of rational numbers, which includes negative rational numbers, particularly negative integers; and
   - reason about the order and absolute value of rational numbers and about the location of points on a coordinate plane.

3. **In the Expressions, Equations and Inequalities domain, students will:**
   - write expressions and equations that correspond to give situations, using variables to represent an unknown and describe relationships between quantities;
   - understand that expressions in different forms can be equivalent and use the properties of operations to rewrite and evaluate expressions in equivalent forms; and
   - use properties of operations and the idea of maintaining the equality of both sides of an equation to solve simple one-step equations.

4. In the Geometry domain, students will:

- reason about relationships among shapes to determine area, surface area and volume. They find areas of right triangles, other triangles and special quadrilaterals by decomposing these shapes, rearranging or removing pieces and relating the shapes to rectangles.
- discuss, develop and justify formulas for areas of triangles and parallelograms. Students find areas of polygons and surface areas of prisms and pyramids by decomposing them into pieces whose area they can determine. They reason about right rectangular prisms with fractional side lengths to extend formulas for the volume of a right rectangular prism to fractional side lengths

5. In the Statistics and Probability domain, students will:

- develop their ability to think statistically;
- recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally and also in the sense that it is a balance point.
- recognize that a measure of variability (interquartile range or mean absolute deviation) can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability.
- learn to describe and summarize numerical data sets, identifying clusters, peaks, gaps and symmetry, considering the context in which the data were collected.

Ratios and Proportional Relationships	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.

Cluster: Understanding ratio concepts and use ratio reasoning to solve problems.	
Standards	**Clarifications**
KY.6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. **MP.2**, **MP.6**	Students use the concept of ratios as a comparison between related quantities; students also express these relationships in equivalent ratios in lowest terms, where appropriate. Coherence KY.5.NF.5→KY.6.RP.1
KY.6.RP.2 Understand the concept of a unit rate a/b associated with a ratio *a:b* with B ≠ 0 and use rate language in the context of a ratio relationship. **MP.2**, **MP.6**	Expectations for unit rates in grade 6 are limited to non-complex fractions; additionally, students reduce ratios of two whole numbers to a unit rate involving a fraction and a denominator of 1. Students describe real-life contexts using ratio language. Coherence KY.5.NF.3→KY.6.RP.2→KY.7.RP.1
KY.6.RP.3 Use ratio and rate reasoning to solve real-world and mathematical problems. a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables and plot the pairs of values on the coordinate plane. Use tables to compare ratios. b. Solve rate problems including those involving unit pricing and constant speed. c. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. **MP.1**, **MP.4**, **MP.7**	a. Students find the missing values in a table, assuming the values in the table represent a proportional relationship; students plot the values from a table on a coordinate plane, with appropriate labels and scales; Students compare the ratios of tables, answering, which has a greater/less rate. b. Students find a unit rate from a given situation and reason to apply it to a future scenario. c. For example, convert miles per hour to feet per hour or meters per minute to meters per hour using appropriate conversion ratios. Coherence KY.6.RP.3→KY.7.RP.2

Attending to the Standards for Mathematical Practice
As students solve similar problems, they develop their skills in several mathematical practice standards, reasoning abstractly and quantitatively ( ), abstracting information from the problem, creating a mathematical representation of the problem and correctly working with both part-part and part-whole situations. Students attend to precision ( ) as they properly use ratio notation, symbolism and label quantities. Representing ratios in various ways help students see the additive and multiplicative structure of ratios ( ). Students model with mathematics ( ) when they solve real-world and mathematical problems using ratio and rate reasoning, especially when they make use of various representations in the modeling process.

The identified mathematical practices, coherence connections and clarifications are possible suggestions; however, they are not the only pathways.

The Number System	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Cluster: Apply and extend previous understandings of multiplication and division to divide fractions by fractions.	
Standards	**Clarifications**
KY.6.NS.1 Interpret and compute quotients of fractions and solve word problems involving division of fractions by fractions. **MP.1**, **MP.2**, **MP.3**	For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient: How much chocolate will each person get if 3 people share 1/2 lb. of chocolate equally? How many 1/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mile? Coherence KY.5.NF.7→KY.6.NS.1→KY.7.NS.2
Attending to the Standards for Mathematical Practice	
Students use concrete representations when understanding the meaning of division and apply it to the division of fractions. They ask themselves, “What is this problem asking me to find?” ( ). For instance, when determining the quotient of fractions, students ask themselves how many sets or groups of the divisor is in the dividend. That quantity is the quotient of the problem. They solve simpler problems to gain insight into the solution. Students confirm, for example, that 10 ÷ 2 can be found by determining how many groups of two are in ten. They apply that strategy to the division of fractions ( ). Students use pictorial representations such as area models, array models, number lines and drawings to conceptualize and solve problems.	

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The Number System	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Cluster: Compute fluently with multi-digit numbers and find common factors and multiples.	
Standards	**Clarifications**
KY.6.NS.2 Fluently divide multi-digit numbers using an algorithm. a. Convert a rational number to a decimal using long division. b. Know that the decimal form of a rational number terminates in 0s or eventually repeats. **MP.7**, **MP.8**	a. Divide a rational number a/b using long division, making sure to include rational numbers equivalent to terminating decimals and rational numbers equivalent to repeating decimals. b. Students understand and explain when they have a 0 remainder in a long division problem, the quotient (answer) is a terminating decimal; students understand when they notice a pattern in the process of dividing, they conclude they will never reach a 0 remainder and they then notate the part of the quotient that is repeating by marking a bar over those values. Coherence KY.5.NBT.6→KY.6.NS.2
KY.6.NS.3 Fluently add, subtract, multiply and divide multi-digit decimals using an algorithm for each operation. **MP.2**, **MP.6**	Emphasis is on the role of the decimal point in operations and how place value is critical to the overall fluency of the performed operations involving decimals. KY.5.NBT.5 Coherence KY.5.NBT.7→KY.6.NS.3→KY.7.NS.3
KY.6.NS.4 Use the distributive property to express a sum of two whole numbers 1 – 100 with a common factor as a multiple of a sum of two whole numbers with no common factor. **MP.8**	Express numerical expressions using the distributive property; understand there may be multiple equivalent expressions, but only one will have been completely factored (the greatest common factor removed using the distributive property) such as 6 + 21 = 3 (2 +7). Coherence KY.4.OA.4→KY.6.NS.4

Attending to the Standards for Mathematical Practice
Students understand and use connections between divisibility and the greatest common factor to apply the distributive property ( ). Students consider units and labels for numbers in contextual problems and consistently refer to what the labels represent to make sense in the problem. Students use precise language and place value ( ) when adding, subtracting, multiplying and dividing by multi-digit decimal numbers. Students read decimal numbers using place value. For example, 326.31 is read as three hundred twenty-six and thirty-one hundredths ( ). Students calculate sums, differences, products and quotients of decimal numbers with a degree of precision appropriate to the problem context.

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The Number System	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Cluster: Apply and extend previous understanding of numbers to the system of rational numbers.	
Standards	**Clarifications**
KY.6.NS.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values; use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. **MP.1. MP.2**, **MP.4**	For example, positive and negative temperatures or elevations, with the understanding that zero means the freezing point Celsius of water or sea level. Coherence KY.6.NS.5→KY.7.NS.1
KY.6.NS.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes, using appropriate range and intervals, to represent points on the line and in the plane, that include negative numbers and coordinates. a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize 0 is its own opposite and the opposite of a negative number is a positive, and the opposite of a negative number is a positive, such as$-(-3) = 3$. b. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. c. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize the similarity between whole numbers, their negative opposites and their positions on a number line, ordered pairs differ only by signs and their locations on one or both axes. **MP.2**, **MP.4**	a. Emphasis is on student understanding that every positive location on a number line has an opposite the same distance from zero in the negative direction and vice versa. Logically following from this is the fact that zero, as it has no positive or negative sign, is its own opposite. b. Emphasis is on generalizing patterns about where coordinates are located on a coordinate plane. c. The intent is for students to see a coordinate axis is the combination of a vertical number line and a horizontal number line. KY.6.EE.6 Coherence KY.5.G.1→KY.6.NS.6→KY.7.NS.1

Standards	Clarifications
KY.6.NS.7 Understand ordering and absolute value of rational numbers. a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. b. Write, interpret and explain statements of order for rational numbers in real-world contexts. c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. d. Distinguish comparisons of absolute value from statements about order. **MP.1. MP.2, MP.4**	a. Interpret two numbers, including two negatives, as one is to the left or right (or above or below) the other on a number line diagram. b. Understand, as with 6.NS.7a, positive and negative rational numbers represent real-life situations and can be compared. c. Interpret a positive or negative direction from zero as an absolute value, or magnitude, to describe a real-life situation. d. Recognize a number's distance from zero can be compared to another number's distance from zero with a "less than" or "greater than" distinction. Coherence KY.5.NBT.3→KY.6.NS.7→KY.7.NS.1 KY.6.EE.8
KY.6.NS.8 Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. **MP.5, MP.7**	For example, represent the vertices of a rectangle in the coordinate plane and find distances between horizontal and vertical vertices accurately. Given a vertex of (-2, 3), a length of 5 and a width of 11, locate the other three vertices of the rectangle. Coherence →KY.5.G.2→KY.6.NS.8

Attending to the Standards for Mathematical Practice

Students use vertical and horizontal number lines to visualize integers and better understand their connection to whole numbers. They divide number line intervals into sub-intervals of tenths to determine the correct placement of rational numbers ( ). Students may represent a decimal as a fraction or a fraction as a decimal to better understand its relationship to other rational numbers to which it is being compared ( ). To explain the meaning of a quantity in a real-life situation (involving elevation, temperature, or direction), students draw a diagram and/or number line to illustrate the location of the quantity in relation to zero or an established level that represents zero in that situation ( ). Students understand the placement of negative numbers on a number line by observing the patterns that exist between negative and positive numbers with respect to zero ( ). They recognize two numbers are opposites if they are the same distance from zero and zero is its own opposite. Students extend their understanding of the number line structure to the coordinate plane to determine a point's location. They recognize the relationship between the signs of a point's coordinates and the quadrant in which the point lies.

Expression and Equations	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Cluster: Apply and extend previous understandings of arithmetic to algebraic expressions.	
Standards	**Clarifications**
KY.6.EE.1 Write and evaluate numerical expressions involving whole-number exponents. **MP.2**, **MP.6**	Interpret an exponent of size *n* as a repetitive multiplication expression of the base multiplied by itself *n* times; use the standard order of operations using exponents to evaluate numerical expressions. Coherence KY.5.NBT.2→KY.6.EE.1→KY.8.EE.1
KY.6.EE.2 Write, read and evaluate expressions in which letters stand for numbers. a. Write expressions that record operations with numbers and with letters standing for numbers. b. Identify parts of an expression using mathematical terms (sums, term, product, factor, quotient, coefficient); view one or more parts of an expression in a single entity. c. Evaluate expressions for specific values of their variables, including values that are non-negative rational numbers. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). **MP.1**, **MP.3**, **MP.4**	For example, a. Express the calculation "y less than 5" as 5 – y. b. Describe the expression 2(8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms. c. Use the formulas $V = s^3$ and $SA = 6s^2$ to find the volume and surface area of a cube with sides of length $s = \frac{1}{2}$ meter. KY.5.OA.1 Coherence KY.5.OA.2→KY.6.EE.2
KY.6.EE.3 Apply the properties of operations to generate equivalent expressions. **MP.7**, **MP.8**	Using Associative, Commutative and Distributive properties to generate equivalent expressions. Coherence KY.5.OA.2→KY.6.EE.3→KY.7.EE.1

Standards	Clarifications
KY.6.EE.4 Identify when two expressions are equivalent when the two expressions name the same number regardless of which value is substituted into them. **MP.2**, **MP.3**, **MP.7**	Students commonly think of variables as a missing number. The focus of this standard is recognizing the variable represents *any* number. In other words, they do not seek to find a single number to replace the letter, but they substitute any number and the expressions will be equivalent. When each expression (not just the variable) is altered by the same value, the expressions remain equivalent, no matter the value. Coherence KY.5.OA.2→KY.6.EE.4→KY.7.EE.1

Attending to the Standards for Mathematical Practice

Students connect symbols to their numerical referents. They understand exponential notation as repeated multiplication of the base number. Students realize 3^2 is represented as 3 × 3, with a product of 9 and explain how 3^2 differs from 3 × 2, where the product is 6. Students determine the meaning of a variable within a real-life context ( ). Students look for structure in expressions by deconstructing them into a sequence of operations. They make use of structure to interpret an expression's meaning in terms of the quantities represented by the variables. In addition, students make use of structure by creating equivalent expressions using properties. For example, students write $6x$ as $x + x + x + x + x + x$, $4x + 2x$, $3(2x)$, or other equivalent expressions ( ). Students look for regularity in a repeated calculation and express it with a general formula ( ). Students work with variable expressions while focusing more on the patterns that develop than the actual numbers that the variable represents. For example, students move from an expression such as $3 + 3 + 3 + 3 = 4 \cdot 3$ to the general form $m + m + m + m = 4 \cdot m$, or $4m$. Similarly, students move from expressions such as $5 \cdot 5 \cdot 5 \cdot 5 = 5^4$ to the general form $m \cdot m \cdot m \cdot m = m^4$. These are especially important when moving from the general form back to a specific value for the variable ( ).

Expressions and Equations	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.

Cluster: Reason about and solve one-variable equation and inequalities.	
Standards	**Clarifications**
KY.6.EE.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. **MP.1**, **MP.2**, **MP.7**	From a set of numbers, substitute values to choose which satisfy a given equation or inequality. An equation or inequality with no solutions from the list may be described as having no solutions or an empty set of solutions, given the set of possible values. Coherence KY.6.EE.5→KY.8.EE.8
KY.6.EE.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or depending on the purpose at hand, any number in a specified set. **MP.2**, **MP.6**	Represent an unknown quantity in real-world context appropriately with a variable and write an expression to show this. Coherence KY.6.EE.6→KY.7.EE.4
KY.6.EE.7 Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers. **MP.1**, **MP.2**, **MP.3**, **MP.4**	Emphasis is on understanding equations can be solved by using subtraction as an opposite operation of addition and division as an opposite operation of multiplication. Additionally, emphasis is on the importance of keeping the equations balanced when solving. Coherence KY.6.EE.7→KY.7.EE.4
KY.6.EE.8 Write an inequality of the form $x > c$, $x < c$, $x \geq c$, or $x \leq c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of these forms have infinitely many solutions; represent solutions of such inequalities on vertical and horizontal number lines. **MP.3**, **MP.7**	Emphasis is on students understanding the phrases "more than", "less than", "at least" and "at most" represent constraints and conditions and are therefore associated with the operators listed in real-world problems. Students also understand an inequality does not yield a specific value, but rather an infinite range of values. Students also appropriately represent solutions to inequalities using both open and closed circles, along with direction, on vertical and horizontal number lines. Coherence KY.6.EE.8→KY.7.EE.4

Attending to the Standards for Mathematical Practice
Students have previously explored the concept of equality. In grade 6, students explore equations as one expression being set equal to a specific value. A solution is a value of the variable that makes the equation true and students may use various processes to identify such values that, when substituted for the variable, will make the equation true ( ). This reasoning is also applied when recognizing solutions for inequalities, such that students realize the value of a variable is one that would make the inequality statement true. Students use manipulatives and pictures (e.g., tape-like diagrams) to represent the equations and their solution strategies. When writing equations, students learn to be precise in their definition of a variable ( ), for example, writing “n equals John’s age in years” as opposed to writing “n is John”. Students use tables and graphs to compare different expressions or equations to make decisions in real-world scenarios. These models also create structure as students gain knowledge in writing expressions and equations ( ).

The identified mathematical practices, coherence connections and clarifications are possible suggestions; however, they are not the only pathways.

Expressions and Equations	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.

Cluster: Represent and analyze quantitative relationships between dependent and independent variables.

Standards	Clarifications/Illustrations
KY.6.EE.9 Use variables to represent two quantities in a real-world problem that changes in relationship to one another; a. Appropriately recognize one quantity as the dependent variable and the other as the independent variable. b. Write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. c. Analyze the relationship between the dependent and independent variables using graphs and tables and relate these to the question. **MP.3**, **MP.4**, **MP.7**	Students understand in real-world problems, one quantity dependently changes relative to another independent quantity at a constant rate; understand, at times, the quantities given may not have a clear independent/dependent relationship. Coherence KY.5.OA.3→KY.6.EE.9→KY.8.EE.5

Attending to the Standards for Mathematical Practice

Students show relationships between quantities with multiple representations, using language, a table, an equation, or a graph. Translating between multiple representations helps students understand each form represents the same relationship and provides a different perspective on the relationship. ( ) Students construct arguments supporting mathematical claims about the relationship between the dependent and independent variable using evidence from the different representations. Students are also equipped to examine the evidence and claims of other students while comparing the different representations. Students model with mathematics ( ) the relationship between dependent and independent variables. Students use many forms to represent the relationship between quantities. Students demonstrate a mathematical model by translating between multiple representations to provide different perspectives on the relationship at hand.

Geometry	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Cluster: Solve real-world and mathematical problems involving area, surface area and volume.	
Standards	**Clarifications**
KY.6.G.1 Find the area of right triangles, other triangles, special quadrilaterals and polygons by composing into rectangles or decomposing into triangles and quadrilaterals; apply these techniques in the context of solving real-world and mathematical problems. **MP.1**, **MP.6**, **MP.8**	Area of the listed shapes may be thought of as a rectangle with larger area, subtracting the areas exterior to the actual shape to obtain the true area, or as a composite area of smaller triangles and rectangles which sum to the true area of the given shape. Students recognize given shapes can be combined to find area or decomposed to find area and one method may be more efficient than the other. Coherence KY.5.NF.4→KY.6.G.1→KY.7.G.6
KY.6.G.2 Find the volume of a right rectangular prism with rational number edge lengths. Apply the formulas $V = lwh$ and $V = Bh$ to find volumes of right rectangular prisms with rational number edge lengths in the context of solving real-world and mathematical problems. **MP.2**, **MP.5**, **MP.6**	Coherence KY.5.MD.5→KY.6.G.2→KY.7.G.6
KY.6.G.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. **MP.4**, **MP.5**, **MP.6**	For example, a gardener draws a map of his garden on a coordinate plane with vertices (-2, 7), (-2, -1), (4, 7). What is the base and height of this triangle? What is the area of his garden, assuming each unit on the coordinate plane is 1 meter? Coherence KY.5.G.2→KY.6.G.3
KY.6.G.4 Classify three-dimensional figures including cubes, prisms, pyramids, cones and spheres. **MP.2**, **MP.3**	Emphasis is on classifying three-dimensional shapes and specifically the attributes of each shape that make it unique to its classification. Coherence KY.6.G.4→KY.7.G.6

Attending to the Standards for Mathematical Practice
Students make sense of real-world problems involving area, volume and surface area. Students begin to understand any shape can be thought of as a series of simpler shapes, merely stitched together to form a composite shape ( ). They begin to visualize the volume of any given shape as a bounded region, filled with smaller cubes of equal size ( ) and understand, by doing so, they approximate the volume of a three-dimensional shape with integer edge lengths ( ) and then, continue this reasoning by precisely finding the volume of figures with rational edge lengths (, ,). Generalizing the study of geometric shapes to the coordinate plane gives students a tool to precisely calculate side lengths and area of shapes. When two different units are given within a problem, students know to use previous knowledge of conversions to make the units match before solving the problem (, ,).

Statistics and Probability	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.

Cluster: Develop understanding of the process of statistical reasoning.

Standards	Clarifications/Illustrations
KY.6.SP.0 Apply the four-step investigative process for statistical reasoning. a. Formulate Questions: Formulate a statistical question as one that anticipates variability and can be answered with data. b. Collect Data: Design and use a plan to collect appropriate data to answer a statistical question. c. Analyze Data: Select appropriate graphical methods and numerical measures to analyze data by displaying variability within a group, comparing individual to individual and comparing individual to group. **MP.1**, **MP.4**	Emphasis is on understanding answering a statistical question is completed by an investigative process that encompasses questioning, collection, analysis and interpretation of the data gathered. Coherence KY.5.MD.2→KY.6.SP.0→KY.7.SP.1

Attending to the Standards for Mathematical Practice

The four-step investigative process provides a structure for students to follow that allows them to model many real-world situations with a model ( ). Students use the statistical process to seek to understand the world around them, taking time to pursue the entire process in order to gain insights, looping back to make revisions to the question or data gathering if the results they have do not adequately address their question ( ).

Statistics and Probability	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.
Cluster: Develop understanding of statistical variability.	
Standards	**Clarifications**
KY.6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. **MP.1**, **MP.3**, **MP.6**	For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates a variety of values with associated variability in students' ages. Coherence KY.5.MD.2→KY.6.SP.1→KY.7.SP.1
KY.6.SP.2 Understand that a set of numerical data collected to answer a statistical question has a distribution which can be described by its center, spread and overall shape. **MP.2**, **MP.6**, **MP.7**	Students distinguish between graphical representations which are skewed or approximately symmetric; use a measure of center to describe a set of data. Coherence KY.5.MD.2→KY.6.SP.2→KY.7.SP.3
KY.6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number to describe a typical value, while a measure of variation describes how the values in the distribution vary. **MP.2**, **MP.5**, **MP.6**	Emphasis is on the sensitivity of measures of center to changes in the data, such as mean is generally much more likely to be pulled towards an extreme value than the median. Additionally, measures of variation (range, interquartile range) describe the data by giving a sense of the spread of data points. Coherence KY.6.SP.3→KY.7.SP.4
Attending to the Standards for Mathematical Practice	
Students recognize a question such as "What did I eat for breakfast?" is not a statistical question, whereas "What is the most popular breakfast in my school?" will elicit data they can measure precisely ( ) and draw conclusions based on that data ( ). After collecting data, by creating a distribution of that data, students recognize data generally follows a structure and can be described in terms of that structure ( ). By accurately calculating the mean (or any other statistical measure), students are now more precise in describing data, going from, for example, describe the rainfall for the month as "about average" to "the rainfall this month is slightly higher than the mean of the last 10 years and within the interquartile range for that data." ( )	

The identified mathematical practices, coherence connections and clarifications are possible suggestions; however, they are not the only pathways.

Statistics and Probability	
Standards for Mathematical Practice	
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics.	MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning.

Cluster: Summarize and describe distributions.

Standards	Clarifications
KY.6.SP.4 Display the distribution of numerical data in plots on a number line, including dot plots, histograms and box plots. **MP.6**, **MP.7**	Students create the listed graphical representations in the appropriate context and describe the attributes of each. Coherence KY.5.MD.2→KY.6.SP.4→KY.7.SP.1
KY.6.SP.5 Summarize numerical data sets in relation to their context, such as by: a. Reporting the number of observations. b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. c. Determining quantitative measures of center (median and/or mean) to describe distribution of numerical data. d. Describing distributions of numerical data qualitatively relating to shape (using terms such as cluster, mode(s), gap, symmetric, uniform, skewed-left, skewed-right and the presence of outliers) and quantitatively relating to spread/variability (using terms such as range and interquartile range). e. Relating the choice of measures of center and variability to the shape of the data distribution. **MP.3**, **MP.7**	a. Students understand larger numbers of observations create a more accurate statistical representation than smaller numbers of observations. b. Students describe how the data measured relates to answering a statistical question. c. Students know methods of finding measures of center, including finding median in non-ordered sets of data and a mean is a mathematical average. d. Students describe the shape of data by inspection using the terms listed and calculate the range and interquartile range of a set of data. e. Students recognize mean and range are appropriate measures for symmetrical data while the median and interquartile range may be better measures for skewed data. Coherence KY.6.SP.5→KY.7.SP.1

Attending to the Standards for Mathematical Practice

Students make use of structure by aligning numerical data into plots and histograms. Students characterize their data in a distribution using mathematically precise terms, both quantitatively (mean, IQR, etc.) and qualitatively (skewed, clustered, etc.). ( ). Students summarize their data in a variety of ways, both numerically and graphically and use these summaries to draw conclusions about their results ( ). Additionally, because students are calculating precisely the measures of center and variability for their data, they accurately compare data sets in a variety of ways ( ).